

APRIL 15, 1919

PRICE 25 CENTS

AVIATION AND AERONAUTICAL ENGINEERING



U. S. Seaplane Carrier Huntington at Sea from Aloft
Official Photo U. S. Naval Air Service

SPECIAL FEATURES

THE CAPRONI E-3 NIGHT BOMBER
SIGNIFICANCE OF OXYGEN IN BALLOON GAS
THE BELLANCA C.E. BIPLANE
COURSE IN AERODYNAMICS AND AIRPLANE DESIGN
TREND OF GERMAN AIRPLANE DESIGN

PUBLISHED SEMI-MONTHLY

BY
THE GARDNER-MOFFAT CO., INC.
HARTFORD BUILDING, UNION SQUARE
22 EAST SEVENTEENTH STREET, NEW YORK

Entered as second-class matter, August 8, 1916, at the

Three
Dollars
a Year

VOLUME VI
Number 6

RECEIVED

APR 1919

Dept. of the Air Library
Naval Air Service

HALL-SCOTT



Hall-Scott D-6 Engine Shows Remarkable Test Record

In tests at the Dayton Engineering Laboratories (Delco) with a Hall-Scott D-6 engine in a J-6 Airplane, the average b. h. p. developed was 1,360 c. p. m. This engine, at the test stand, 502 lbs., gave 1,360 b. h. p.

It also gave 1,360 b. h. p. at 1,360 c. p. m. and 1,360 b. h. p. at 1,360 c. p. m. It also gave 1,360 b. h. p. at 1,360 c. p. m. and 1,360 b. h. p. at 1,360 c. p. m.

It also gave 1,360 b. h. p. at 1,360 c. p. m. and 1,360 b. h. p. at 1,360 c. p. m. It also gave 1,360 b. h. p. at 1,360 c. p. m. and 1,360 b. h. p. at 1,360 c. p. m.

HALL-SCOTT MOTOR COMPANY
Dayton, Ohio, U. S. A.

Like the Wings of a Bird!



Christmas Airplanes

The wings of Christmas Airplanes are flexible like those of a bird. The rear of both planes floats upward when the air pressure becomes unnecessarily great. Thus higher speed is attained—and extra safety too, because wind-puffs flex the wings instead of disturbing the balance.

Christmas Airplanes are speedier, safer, and more easily controlled. Write for full information.

Cantilever Aero Company
1269 Broadway, New York City, N.Y.

THE ACE



Low
Cost
of
Up-keep



High
Factor
of
Safety

The ACE Landing in Fifty Feet

Orville Wright, whose opinion is shared by others, contends that aeroplanes must either have a very low landing speed or there must be frequent alighting places provided for them.

The ACE lands normally at twenty-five miles an hour and requires at most a one-hundred foot run. It has been successfully landed in fifty feet.

The ACE is built by an organization skilled in aircraft design—Quantity production is now under way in our factories.

Flights are being made daily at our Flying Field. Demonstration will be given by appointment.

Orders are being accepted for April delivery.

TWENTY-FIVE HUNDRED DOLLARS

AIRCRAFT ENGINEERING CORPORATION

C. M. SWIFT,
Gen. Mgr.
H. W. DALTON,
Chief Engr.
HORACE KEANE,
Sales Mgr.

SALES OFFICES
220 West 42nd Street
NEW YORK
Flying Field—Central Park-Lake Island

GENERAL OFFICES,
2 East End Ave.
FACTORY A
314-37 E. 79th St.
FACTORY M
411-13 East 84th St.



T-12 MARTIN NIGHT BOMBER

THE MOST IMPORTANT AERIAL DEVELOPMENT OF THE WAR

Officially, it has surpassed the performance of every competitor.

The forerunner of the wonderful

AERIAL FREIGHTER and TWELVE PASSENGER AIRPLANE

The skill and ability of the HOUSE OF MARTIN continue to maintain Supremacy of Performance and Dependability which they have held since 1909.



THE GLENN L. MARTIN COMPANY CLEVELAND

Contractors to the United States Government

Anderson



CRANKSHAFTS

FOR

AIRPLANE, AUTOMOBILE, TRUCK AND TRACTOR MOTORS
CAREFULLY FORGED



PROPERLY HEAT TREATED
AND
ACCURATELY MACHINED



TO YOUR BLUE PRINTS AND SPECIFICATIONS

WE ALSO SPECIALIZE IN THE FORGING OF

AXLES

BOTH LIGHT AND HEAVY

CAMSHAFTS, CONNECTING RODS, CONTROL LEVERS,
GEARS, CLUTCH DRUMS AND FORKS, ETC.

UPSET FORGINGS

DRIVE SHAFTS, WHEEL HUBS, COUNTER WEIGHTS, ETC.

SEND US YOUR INQUIRIES

ANDERSON FORGE AND MACHINE CO.
DETROIT, MICHIGAN

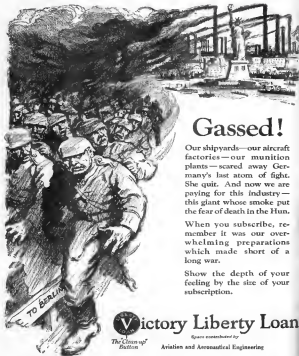
Aeromarine



Sales
Department
Times Bldg.
New York

Factory
Keyport
New Jersey

The experimental age of the airplane has been passed. With its part in the war now a bright epoch in history, the airplane is going to create history in the world of commerce.



Gassed!

Our shipyards—our aircraft factories—our munition plants—scared away Germany's last atom of fight. She quit. And now we are paying for this industry—this giant whose smoke put the fear of death in the Hun.

When you subscribe, remember it was our overwhelming preparations which made short of a long war.

Show the depth of your feeling by the size of your subscription.

Victory Liberty Loan

The Clean up
Button

Sponsored by
Aviation and Aeronautical Engineering

Printed by American Association of Advertising Agencies cooperating with United States Treasury Department

THE Rockwell Radiator is the original Mayo Honeycomb type which allows a vertical, fast flow of water and large air passages. It is built sturdy, strong and durable to withstand the tremendous vibration of airplane motors, at a low light-factor which makes it entirely efficient for airplane use.

We designed and built the first radiator which successfully cooled the wonderful Liberty Motor. Liberty Motors equipped with:

ROCKWELL Motor Radiators

rendered reliable service both here in the training schools and over the lines in France.

Since the beginning of the war we have specialized in the development of airplane devices. We developed the first engine gas in this country to shoot through the path of a revolving propeller. We originally manufactured more machine guns than any other concern in the world. We developed and manufactured two of the three types of the American Army Aerial Bombs.

Our war activities on airplane guns, bombs and radiators have given us an unusual knowledge which enables us to experts on airplane radiator requirements.

**MARLIN-ROCKWELL
CORPORATION
MAYO RADIATOR DIVISION
14011 ST. AND SOUVENIR BLVD.
NEW YORK**



Army 210 Type

MARLIN-ROCKWELL INDUSTRIES

Standard
Radiator
Cooling
Systems
Fuel
Consumption
Reduction
Devices
Machin
Cooling
Systems
Machine Shop
Fabrication
Structural
Steelwork
Welding
Electrical
Sewing
Laboratory
Apprentice
Shop
Division
Machine
Division



The largest selling quality pencil in the world



27 Most Famous
and is marked
The Venus Pencil
20-25-30-35-40-45
The pencil writing
20-25-30-35-40-45
The pencil writing
20-25-30-35-40-45
The pencil writing
20-25-30-35-40-45
The pencil writing
20-25-30-35-40-45

VENUS PENCILS

Absolute dependability in every individual part of his plane is the only guarantee of safety to a pilot. That same dependability in the tools with which his plane are driven is assumed when the Famous VENUS Pencils are employed.

Special 14c. Offer

Send 14 cents for three 20-25-30-35-40-45-50-55-60-65-70-75-80-85-90-95-100-105-110-115-120-125-130-135-140-145-150-155-160-165-170-175-180-185-190-195-200-205-210-215-220-225-230-235-240-245-250-255-260-265-270-275-280-285-290-295-300-305-310-315-320-325-330-335-340-345-350-355-360-365-370-375-380-385-390-395-400-405-410-415-420-425-430-435-440-445-450-455-460-465-470-475-480-485-490-495-500-505-510-515-520-525-530-535-540-545-550-555-560-565-570-575-580-585-590-595-600-605-610-615-620-625-630-635-640-645-650-655-660-665-670-675-680-685-690-695-700-705-710-715-720-725-730-735-740-745-750-755-760-765-770-775-780-785-790-795-800-805-810-815-820-825-830-835-840-845-850-855-860-865-870-875-880-885-890-895-900-905-910-915-920-925-930-935-940-945-950-955-960-965-970-975-980-985-990-995-1000-1005-1010-1015-1020-1025-1030-1035-1040-1045-1050-1055-1060-1065-1070-1075-1080-1085-1090-1095-1100-1105-1110-1115-1120-1125-1130-1135-1140-1145-1150-1155-1160-1165-1170-1175-1180-1185-1190-1195-1200-1205-1210-1215-1220-1225-1230-1235-1240-1245-1250-1255-1260-1265-1270-1275-1280-1285-1290-1295-1300-1305-1310-1315-1320-1325-1330-1335-1340-1345-1350-1355-1360-1365-1370-1375-1380-1385-1390-1395-1400-1405-1410-1415-1420-1425-1430-1435-1440-1445-1450-1455-1460-1465-1470-1475-1480-1485-1490-1495-1500-1505-1510-1515-1520-1525-1530-1535-1540-1545-1550-1555-1560-1565-1570-1575-1580-1585-1590-1595-1600-1605-1610-1615-1620-1625-1630-1635-1640-1645-1650-1655-1660-1665-1670-1675-1680-1685-1690-1695-1700-1705-1710-1715-1720-1725-1730-1735-1740-1745-1750-1755-1760-1765-1770-1775-1780-1785-1790-1795-1800-1805-1810-1815-1820-1825-1830-1835-1840-1845-1850-1855-1860-1865-1870-1875-1880-1885-1890-1895-1900-1905-1910-1915-1920-1925-1930-1935-1940-1945-1950-1955-1960-1965-1970-1975-1980-1985-1990-1995-2000-2005-2010-2015-2020-2025-2030-2035-2040-2045-2050-2055-2060-2065-2070-2075-2080-2085-2090-2095-2100-2105-2110-2115-2120-2125-2130-2135-2140-2145-2150-2155-2160-2165-2170-2175-2180-2185-2190-2195-2200-2205-2210-2215-2220-2225-2230-2235-2240-2245-2250-2255-2260-2265-2270-2275-2280-2285-2290-2295-2300-2305-2310-2315-2320-2325-2330-2335-2340-2345-2350-2355-2360-2365-2370-2375-2380-2385-2390-2395-2400-2405-2410-2415-2420-2425-2430-2435-2440-2445-2450-2455-2460-2465-2470-2475-2480-2485-2490-2495-2500-2505-2510-2515-2520-2525-2530-2535-2540-2545-2550-2555-2560-2565-2570-2575-2580-2585-2590-2595-2600-2605-2610-2615-2620-2625-2630-2635-2640-2645-2650-2655-2660-2665-2670-2675-2680-2685-2690-2695-2700-2705-2710-2715-2720-2725-2730-2735-2740-2745-2750-2755-2760-2765-2770-2775-2780-2785-2790-2795-2800-2805-2810-2815-2820-2825-2830-2835-2840-2845-2850-2855-2860-2865-2870-2875-2880-2885-2890-2895-2900-2905-2910-2915-2920-2925-2930-2935-2940-2945-2950-2955-2960-2965-2970-2975-2980-2985-2990-2995-3000-3005-3010-3015-3020-3025-3030-3035-3040-3045-3050-3055-3060-3065-3070-3075-3080-3085-3090-3095-3100-3105-3110-3115-3120-3125-3130-3135-3140-3145-3150-3155-3160-3165-3170-3175-3180-3185-3190-3195-3200-3205-3210-3215-3220-3225-3230-3235-3240-3245-3250-3255-3260-3265-3270-3275-3280-3285-3290-3295-3300-3305-3310-3315-3320-3325-3330-3335-3340-3345-3350-3355-3360-3365-3370-3375-3380-3385-3390-3395-3400-3405-3410-3415-3420-3425-3430-3435-3440-3445-3450-3455-3460-3465-3470-3475-3480-3485-3490-3495-3500-3505-3510-3515-3520-3525-3530-3535-3540-3545-3550-3555-3560-3565-3570-3575-3580-3585-3590-3595-3600-3605-3610-3615-3620-3625-3630-3635-3640-3645-3650-3655-3660-3665-3670-3675-3680-3685-3690-3695-3700-3705-3710-3715-3720-3725-3730-3735-3740-3745-3750-3755-3760-3765-3770-3775-3780-3785-3790-3795-3800-3805-3810-3815-3820-3825-3830-3835-3840-3845-3850-3855-3860-3865-3870-3875-3880-3885-3890-3895-3900-3905-3910-3915-3920-3925-3930-3935-3940-3945-3950-3955-3960-3965-3970-3975-3980-3985-3990-3995-4000-4005-4010-4015-4020-4025-4030-4035-4040-4045-4050-4055-4060-4065-4070-4075-4080-4085-4090-4095-4100-4105-4110-4115-4120-4125-4130-4135-4140-4145-4150-4155-4160-4165-4170-4175-4180-4185-4190-4195-4200-4205-4210-4215-4220-4225-4230-4235-4240-4245-4250-4255-4260-4265-4270-4275-4280-4285-4290-4295-4300-4305-4310-4315-4320-4325-4330-4335-4340-4345-4350-4355-4360-4365-4370-4375-4380-4385-4390-4395-4400-4405-4410-4415-4420-4425-4430-4435-4440-4445-4450-4455-4460-4465-4470-4475-4480-4485-4490-4495-4500-4505-4510-4515-4520-4525-4530-4535-4540-4545-4550-4555-4560-4565-4570-4575-4580-4585-4590-4595-4600-4605-4610-4615-4620-4625-4630-4635-4640-4645-4650-4655-4660-4665-4670-4675-4680-4685-4690-4695-4700-4705-4710-4715-4720-4725-4730-4735-4740-4745-4750-4755-4760-4765-4770-4775-4780-4785-4790-4795-4800-4805-4810-4815-4820-4825-4830-4835-4840-4845-4850-4855-4860-4865-4870-4875-4880-4885-4890-4895-4900-4905-4910-4915-4920-4925-4930-4935-4940-4945-4950-4955-4960-4965-4970-4975-4980-4985-4990-4995-5000-5005-5010-5015-5020-5025-5030-5035-5040-5045-5050-5055-5060-5065-5070-5075-5080-5085-5090-5095-5100-5105-5110-5115-5120-5125-5130-5135-5140-5145-5150-5155-5160-5165-5170-5175-5180-5185-5190-5195-5200-5205-5210-5215-5220-5225-5230-5235-5240-5245-5250-5255-5260-5265-5270-5275-5280-5285-5290-5295-5300-5305-5310-5315-5320-5325-5330-5335-5340-5345-5350-5355-5360-5365-5370-5375-5380-5385-5390-5395-5400-5405-5410-5415-5420-5425-5430-5435-5440-5445-5450-5455-5460-5465-5470-5475-5480-5485-5490-5495-5500-5505-5510-5515-5520-5525-5530-5535-5540-5545-5550-5555-5560-5565-5570-5575-5580-5585-5590-5595-5600-5605-5610-5615-5620-5625-5630-5635-5640-5645-5650-5655-5660-5665-5670-5675-5680-5685-5690-5695-5700-5705-5710-5715-5720-5725-5730-5735-5740-5745-5750-5755-5760-5765-5770-5775-5780-5785-5790-5795-5800-5805-5810-5815-5820-5825-5830-5835-5840-5845-5850-5855-5860-5865-5870-5875-5880-5885-5890-5895-5900-5905-5910-5915-5920-5925-5930-5935-5940-5945-5950-5955-5960-5965-5970-5975-5980-5985-5990-5995-6000-6005-6010-6015-6020-6025-6030-6035-6040-6045-6050-6055-6060-6065-6070-6075-6080-6085-6090-6095-6100-6105-6110-6115-6120-6125-6130-6135-6140-6145-6150-6155-6160-6165-6170-6175-6180-6185-6190-6195-6200-6205-6210-6215-6220-6225-6230-6235-6240-6245-6250-6255-6260-6265-6270-6275-6280-6285-6290-6295-6300-6305-6310-6315-6320-6325-6330-6335-6340-6345-6350-6355-6360-6365-6370-6375-6380-6385-6390-6395-6400-6405-6410-6415-6420-6425-6430-6435-6440-6445-6450-6455-6460-6465-6470-6475-6480-6485-6490-6495-6500-6505-6510-6515-6520-6525-6530-6535-6540-6545-6550-6555-6560-6565-6570-6575-6580-6585-6590-6595-6600-6605-6610-6615-6620-6625-6630-6635-6640-6645-6650-6655-6660-6665-6670-6675-6680-6685-6690-6695-6700-6705-6710-6715-6720-6725-6730-6735-6740-6745-6750-6755-6760-6765-6770-6775-6780-6785-6790-6795-6800-6805-6810-6815-6820-6825-6830-6835-6840-6845-6850-6855-6860-6865-6870-6875-6880-6885-6890-6895-6900-6905-6910-6915-6920-6925-6930-6935-6940-6945-6950-6955-6960-6965-6970-6975-6980-6985-6990-6995-7000-7005-7010-7015-7020-7025-7030-7035-7040-7045-7050-7055-7060-7065-7070-7075-7080-7085-7090-7095-7100-7105-7110-7115-7120-7125-7130-7135-7140-7145-7150-7155-7160-7165-7170-7175-7180-7185-7190-7195-7200-7205-7210-7215-7220-7225-7230-7235-7240-7245-7250-7255-7260-7265-7270-7275-7280-7285-7290-7295-7300-7305-7310-7315-7320-7325-7330-7335-7340-7345-7350-7355-7360-7365-7370-7375-7380-7385-7390-7395-7400-7405-7410-7415-7420-7425-7430-7435-7440-7445-7450-7455-7460-7465-7470-7475-7480-7485-7490-7495-7500-7505-7510-7515-7520-7525-7530-7535-7540-7545-7550-7555-7560-7565-7570-7575-7580-7585-7590-7595-7600-7605-7610-7615-7620-7625-7630-7635-7640-7645-7650-7655-7660-7665-7670-7675-7680-7685-7690-7695-7700-7705-7710-7715-7720-7725-7730-7735-7740-7745-7750-7755-7760-7765-7770-7775-7780-7785-7790-7795-7800-7805-7810-7815-7820-7825-7830-7835-7840-7845-7850-7855-7860-7865-7870-7875-7880-7885-7890-7895-7900-7905-7910-7915-7920-7925-7930-7935-7940-7945-7950-7955-7960-7965-7970-7975-7980-7985-7990-7995-8000-8005-8010-8015-8020-8025-8030-8035-8040-8045-8050-8055-8060-8065-8070-8075-8080-8085-8090-8095-8100-8105-8110-8115-8120-8125-8130-8135-8140-8145-8150-8155-8160-8165-8170-8175-8180-8185-8190-8195-8200-8205-8210-8215-8220-8225-8230-8235-8240-8245-8250-8255-8260-8265-8270-8275-8280-8285-8290-8295-8300-8305-8310-8315-8320-8325-8330-8335-8340-8345-8350-8355-8360-8365-8370-8375-8380-8385-8390-8395-8400-8405-8410-8415-8420-8425-8430-8435-8440-8445-8450-8455-8460-8465-8470-8475-8480-8485-8490-8495-8500-8505-8510-8515-8520-8525-8530-8535-8540-8545-8550-8555-8560-8565-8570-8575-8580-8585-8590-8595-8600-8605-8610-8615-8620-8625-8630-8635-8640-8645-8650-8655-8660-8665-8670-8675-8680-8685-8690-8695-8700-8705-8710-8715-8720-8725-8730-8735-8740-8745-8750-8755-8760-8765-8770-8775-8780-8785-8790-8795-8800-8805-8810-8815-8820-8825-8830-8835-8840-8845-8850-8855-8860-8865-8870-8875-8880-8885-8890-8895-8900-8905-8910-8915-8920-8925-8930-8935-8940-8945-8950-8955-8960-8965-8970-8975-8980-8985-8990-8995-9000-9005-9010-9015-9020-9025-9030-9035-9040-9045-9050-9055-9060-9065-9070-9075-9080-9085-9090-9095-9100-9105-9110-9115-9120-9125-9130-9135-9140-9145-9150-9155-9160-9165-9170-9175-9180-9185-9190-9195-9200-9205-9210-9215-9220-9225-9230-9235-9240-9245-9250-9255-9260-9265-9270-9275-9280-9285-9290-9295-9300-9305-9310-9315-9320-9325-9330-9335-9340-9345-9350-9355-9360-9365-9370-9375-9380-9385-9390-9395-9400-9405-9410-9415-9420-9425-9430-9435-9440-9445-9450-9455-9460-9465-9470-9475-9480-9485-9490-9495-9500-9505-9510-9515-9520-9525-9530-9535-9540-9545-9550-9555-9560-9565-9570-9575-9580-9585-9590-9595-9600-9605-9610-9615-9620-9625-9630-9635-9640-9645-9650-9655-9660-9665-9670-9675-9680-9685-9690-9695-9700-9705-9710-9715-9720-9725-9730-9735-9740-9745-9750-9755-9760-9765-9770-9775-9780-9785-9790-9795-9800-9805-9810-9815-9820-9825-9830-9835-9840-9845-9850-9855-9860-9865-9870-9875-9880-9885-9890-9895-9900-9905-9910-9915-9920-9925-9930-9935-9940-9945-9950-9955-9960-9965-9970-9975-9980-9985-9990-9995-10000-10005-10010-10015-10020-10025-10030-10035-10040-10045-10050-10055-10060-10065-10070-10075-10080-10085-10090-10095-10100-10105-10110-10115-10120-10125-10130-10135-10140-10145-10150-10155-10160-10165-10170-10175-10180-10185-10190-10195-10200-10205-10210-10215-10220-10225-10230-10235-10240-10245-10250-10255-10260-10265-10270-10275-10280-10285-10290-10295-10300-10305-10310-10315-10320-10325-10330-10335-10340-10345-10350-10355-10360-10365-10370-10375-10380-10385-10390-10395-10400-10405-10410-10415-10420-10425-10430-10435-10440-10445-10450-10455-10460-10465-10470-10475-10480-10485-10490-10495-10500-10505-10510-10515-10520-10525-10530-10535-10540-10545-10550-10555-10560-10565-10570-10575-10580-10585-10590-10595-10600-10605-10610-10615-10620-10625-10630-10635-10640-10645-10650-10655-10660-10665-10670-10675-10680-10685-10690-10695-10700-10705-10710-10715-10720-10725-10730-10735-10740-10745-10750-10755-10760-10765-10770-10775-10780-10785-10790-10795-10800-10805-10810-10815-10820-10825-10830-10835-10840-10845-10850-10855-10860-10865-10870-10875-10880-10885-10890-10895-10900-10905-10910-10915-10920-10925-10930-10935-10940-10945-10950-10955-10960-10965-10970-10975-10980-10985-10990-10995-11000-11005-11010-11015-11020-11025-11030-11035-11040-11045-11050-11055-11060-11065-11070-11075-11080-11085-11090-11095-11100-11105-11110-11115-11120-11125-11130-11135-11140-11145-11150-11155-11160-11165-11170-11175-11180-11185-11190-11195-11200-11205-11210-11215-11220-11225-11230-11235-11240-11245-11250-11255-11260-11265-11270-11275-11280-11285-11290-11295-11300-11305-11310-11315-11320-11325-11330-11335-11340-11345-11350-11355-11360-11365-11370-11375-11380-11385-11390-11395-11400-11405-11410-11415-11420-11425-11430-11435-11440-11445-11450-11455-11460-11465-11470-11475-11480-11485-11490-11495-11500-11505-11510-11515-11520-11525-11530-11535-11540-11545-11550-11555-11560-11565-11570-11575-11580-11585-11590-11595-11600-11605-11610-11615-11620-11625-11630-11635-11640-11645-11650-11

Quality



Magneto
Type

EVERY layout that calls for a bearing peculiarly adapted to the lighter ranges of loads and high speeds finds its natural solution in the New Departure Magneto type.

The workmanship is exceptionally expert, and it assures the essential qualifications of noiseless operation, absolute accuracy of dimension and finish and consequent inter-fitness of all parts.

Write for engineering data on the New Departure Magneto type bearing

THE NEW DEPARTURE MANUFACTURING COMPANY,
Detroit, Conn. Detroit, Mich.

General Sales Offices,
418

New Departure Ball Bearings

E. B. GARDNER
PRESIDENT AND EDITOR
W. D. McFARLANE
MANAGING EDITOR
W. L. BEAMAN
TREASURER
H. M. WILLIAMS
GENERAL MANAGER

AVIATION AND AERONAUTICAL ENGINEERING

ALEXANDER KLEMIN
TECHNICAL EDITOR
LEONIDAS WORTH
ASSISTANT EDITOR
GEORGE NEWBOLD
BUSINESS MANAGER

Vol. VI

April 15, 1919

No. 6

FIVE months have now elapsed since the signing of armistice brought the war to an end. The vast air forces which the Allies organized for the victorious termination of the war are now going through the process of demobilization and plans are being formulated for the establishment of aerial transport services which would utilize to best advantage the surplus of aeronautical personnel and material the general demobilization is creating.

That in the formulation of these plans coordination is imperative will not be disputed in view of the novel nature of the field aeronautics is to enter. Everything in this domain has to be determined experimentally, from the most advantageous types of aircraft to rules of traffic, from aerial farms to insurance, from territorial rights to the organization of landing stations, and so forth.

The magnitude of this work can hardly be overestimated and yet as justifies the demand that it be carried out without friction, that is, in coordination. This requirement is naturally most satisfactorily answered where the government takes a hand in the matter and gives assistance to those concerned in their struggle with these much involved questions.

In Great Britain, with the demobilization of the Royal Air Force, General Hylke has been appointed Controller General of Civil Aviation, and will head in the Air Ministry a department entirely devoted to the control and development of commercial aeronautics.

The Royal Air Force estimate for 1918-20 provide a sum of \$15,000,000 for civil aeronautics, two-thirds of which are to go to research and experiments while the remainder is to be employed for the maintenance of the new department and the development of transport aircraft.

In France, Colonel Ledere, formerly D. C. of the Aerial Defense of Paris, has been appointed Director of Civil Aeronautics and is charged with the task of organizing the entire system of commercial aerial routes. In this work he will have the assistance of the Commission of Civil Aviation, which the French government created early in 1917. Colonel Ledere has already perfected a preliminary project of linking up the principal towns of France by a system of aerial routes, with main stations situated every 150 miles or so, and marked for both day and night flying. In short, the French government intends to organize the whole aeronautical ground establishment, such as hangars, repair shops, stores and staffs, and have the exploitation of the aerial routes to companies chartered to carry passengers, goods and mail.

Thus does France stimulate the development of commercial aeronautics.

In view of the above it may be asked what are our own authorities doing to foster aerial transport? There is no instance, within the National Advisory Committee for Aeronautics, a sub-committee on civil aerial transport, which has for some time been engaged in formulating a report on the principal problems of civil aeronautics. The publication of an early date of this report will be awaited with considerable interest, not to say anxiety, by all concerned with the best interests of American aeronautics.

The Variable Pitch Propeller

Some recent tests have demonstrated that it is entirely practicable to construct a variable pitch propeller and that by its use both speed and climb may be appreciably increased. Yet at the same time the increase in efficiency has not been as great as commonly expected on theoretical grounds.

Engineers in discussing the variable pitch propeller have tacitly assumed that since the efficiency of the element of a propeller is largely dependent on its angle of incidence and the corresponding lift over drag ratio, by suitably varying the pitch the same angle of incidence could be maintained under all flight conditions and consequently the same efficiency.

Unfortunately the efficiency of an element is not solely dependent on the lift over drag ratio; it is dependent on the pitch angle also, which should be as large as possible for efficiency, and it is further dependent on the ratio of the velocity of the slipstream to the velocity of the plane. The three questions are associated in a complicated way, and these relationships are at the very basis of our propulsive theory.

Thus on a climb, as matter what is done to the pitch and to the angle of incidence of a blade element, the forward speed must diminish and the velocity of the slip stream increase with the thrust, which means a decrease in efficiency of even the same angle of incidence is maintained. It follows from this that the efficiency of a propeller under varying conditions is not entirely within the control of the variable pitch propeller. Where the main ability of the device lies, is that by making possible a smaller angle of attack, the engine can require most of the P , Q , M , K losses in a climb.

In spite of this, important improvements can be obtained. Thus with a JN-4B equipped with a 150 hp. engine, a gain in ceiling of 3000 feet was obtained. At 15,000 feet, with the variable pitch propeller, a speed of 83.2 m. p. h. was attained as compared with the 78 m. p. h. of the fixed propeller.

The Caproni E-3 Night Bomber

The Caproni E-3 night bomber is a three-engine biplane of considerable capacity, which was developed during the war in Italy with the view of being a heavy load-carrying airplane in which the splitting of the power plant into three independent engine units would insure great reliability of operation. This type of Caproni bomber—there also exists a three-

may be seen from the accompanying illustrations (Fig. 1).

Otherwise, from the engineering point of view, this machine does not differ particularly from the general construction of conventional designs, though attention may be called to the lack of vertical fin surface shaft and the use of three tail wheel rollers which is a feature seldom met with elsewhere.



FIG. 1. THREE-QUARTER REAR VIEW OF THE CAPRONI E-3

engine biplane of large dimensions—has extensively been used in the Italian and French fronts for long-range night bombing, and though its general outline has hardly changed since it was introduced in the Italian air service in 1918, the power plant has undergone many alterations. At first Gnome, Le Rhône, Renault and Siemens engines were used in various combinations, and it was only when the Fiat 200 hp engine became available that the use of the latter became standard in the Caproni bomber's construction in Italy.

The machine described and illustrated hereafter, which was manufactured by the Standard Aircraft Corp. differs only in minor details from its Italian prototype, though its dimensions have been increased with respect to the latter in order to carry the heavier and more powerful Liberty-12 engines. These are of the low-compression, Navy type, and develop 200 hp at 1260 rpm.; the fuel consumption is 35 lb. per hp hr., the oil consumption 30 lb. per hp hr.

The mounting of these engines constitutes the most outstanding feature of the Caproni bomber, for this arrangement is not met with in any other existing airplane; it may be described as follows: In the rear portion of a raised nacelle, which affords accommodation to the crew of three and contains two control seats, instruments, bench seats and gun sockets, is fitted a Liberty-12, driving a pusher propeller, a fuel tank of 120 gal. capacity and an oil tank of 100 gal. capacity are fitted in front of the engine, while the radiator is set into the nose of the nacelle. On either side of the nacelle there is a wing fuselage which carries a Liberty 12 with similar engine and fuel and oil tanks, and also all tanks of the same capacity as those in the nacelle. These wing fuselages extend all the way back and serve to support the tail unit, so

The gross, or flying, weight of the machine is 12,214 lb., and the total wing area 1,264 sq. ft.; the wing loading is consequently 9.3 lb./sq. ft., and the power loading, with three Liberty-type Liberty engines, 10 lb./sq. ft. The ground speed is 100 mph., and the climb, 6000 ft. in 16 sec., 23 sec., and 32,000 ft. in 40 min.



FIG. 2. FRONT PART OF THE CAPRONI E-3

The armament consists of two Lewis Guns, one of which is mounted on a gun-ring in the nose of the nacelle, while the other is carried behind the wings on a highly built steel gun turret (Fig. 3), which affords the latter gunners a very wide area of fire, covering virtually every angle. In addition to this defensive armament, six 250 lb. and four 118 lb. bombs are carried in racks in the nacelle for all-forward work.

The main constructional features of the Caproni E-3 night bomber are given hereafter, together with a tabulation of dimensions and weights.

Main Planes

Main planes are in five sections, each respective and top, top and bottom, being of the same length. Chord of the upper curve of wing section is 3.087 m., and the maximum airfoil section 32.092 m. back from the leading edge; angle of upper curve is 7.616 m., and maximum ordinate is 20.37 ft. from leading edge. The greatest thickness of rib is 4.955 m., and occurs 35.116 m. from leading edge. The angle of airfoil of top plane is 5 ft. 30 in. of bottom plane 5 ft., the gap is 9 ft. 90 in.

All airfoils have wing struts, except the four large air struts paralleling vertical ribs of fuselage and the four central struts from main longitudinal members of nacelle to planes, are of stream-line section steel tubing which are visible, or of round steel tubes and stream-line tubing of spars. The four short

central struts running from nacelle to upper plane are all of upper and tube construction, and the rest struts out on the other side are of two beam construction.

All struts include one of the same general design, but not

trust lips protruding above again. All are drilled. The center lips move the struts, which is secured with a bolt passing fore and aft through all, the two outside lips have a bolt passing through which secures the two outside and inside ends of later-

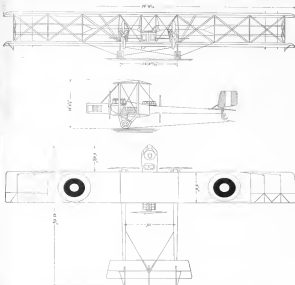


FIG. 3. VARIOUS DRAWINGS

streamlining, due to the fact that these parts coming clear to the center of the nacelle and receiving greater stresses are built heavier. This is also true of the struts, whose main section decreases as the wing tips are reached. The steel nacelle consists of two steel plates welded to the fore and aft sides of a square steel spar, which is turn is slipped over the outside side of the spine, secured thereto with three 3/4-in. bolts, the top adjoining sections have their spars slipped into the holes. The two plates forming strut sockets have three di-

agonal wiring. The bolt passing through strut ends also serves as an anchorage for all nacelle wires.

The two central sections are 16 ft. 1.58 in. long, it terminates 18 ft. 53 in., and entire nacelle 11 ft. 10 in. All main plane spars are 1.39/32 in. x 9 3/8 in., the greatest depth of spar, being in the vertical plane. Central section and upper intermediate section open out of ribs, all others through the or spars. All spars are built up of two laminations, whose a narrow sides have been channelled for lightness.

truly. Assuming the latter figure as substantially correct, a simple calculation shows that the "air" in the envelope contained 50 per cent oxygen.

In another case the purity calculated from the oxygen determination was 80 per cent, and the specific gravity showed the presence of 80 per cent hydrogen. These figures indicate an oxygen content of 30.0 per cent in the "air" in the balloon. It is clear, therefore, that the determination of the oxygen content alone will not indicate the purity of the hydrogen. The specific gravity gives more reliable data for this purpose. The determination of oxygen may be useful, however, from another standpoint. It would be useful to handle a balloon filled with an explosive mixture even if the gas still had a useful life. Because of the increase in the oxygen content, the explosive limits of the mixture are reached earlier than in the hydrogen case and are contaminated with normal air.

The data given in the literature dealing with the explosive limits of hydrogen and air and hydrogen and oxygen are somewhat contradictory and confusing. This is in part due to the fact that the explosive limit may vary with the existing conditions such as temperature and state of point of separation. The explosive limits of a gas are usually defined as the minimum and maximum percentages of the combustible gas with air or with oxygen which will propagate a flame satisfactorily in any direction (from any point of ignition). Because of the existence of heat convection, a flame will be propagated more easily from the bottom of a balloon upwards than from the top down. The upper limit of hydrogen with air is variously given as 60 to 70 per cent; the upper limit of hydrogen with oxygen is given as approximately 90 per cent. Looking at the question from another angle, the explosive limit of oxygen in hydrogen is about 5 per cent, for the lateral mixture this limit can be considered to be not greatly changed by the probable variation of the amount of oxygen present.

If a mixture of 80 per cent hydrogen and 20 per cent normal air is safe to handle, a mixture in a balloon where the "air" contained 50 per cent oxygen would be on the border line of safety, when the purity of the hydrogen sank to 80 per cent, because it would then contain 5 per cent oxygen. Where it, in the practice is desired the hydrogen when so purely has reached 80 per cent, it should be appreciated that the gas is essentially an explosive mixture and the stated caution should be used in its handling.

Flexible Tubing

All commercial flexible tubing is pulled from strip metal, and forced over or passing through dies so as to make an airtight ring joint.

The flexibility in ordinary, full or semi-extended tubing is obtained from the sliding action of the joint parts, one on the other, within the joint, the end remaining rigid.

The bending in Teflon tubing, as distinguished from that in ordinary tubing, takes place within angular displacements which are substantially at right angles to the axis of the tube and formed by the sides of U-shaped corrugations. The air-tight joints comprising the seams are composed of a heavy pressure to make a continuous, tight rubberized structure. The flexibility in this extends within the metal and the seams is generally weak.

The joints or seams of articulated tubing are not inherently tight and in most pressure conditions must be packed with a soft, sheet of asbestos, cotton, or rubber composition. This packing is the only means for tightness but it rapidly disintegrates under the action of gasoline with the result that at maximum the fuel and eventually seeps in flow. Where an outside casing is used, this loss becomes practically zero, the fuel and air being beyond the loss of field also fire risk.

The capacity of Teflon tubing over other construction and over woven rubber hose consists in that it is permanently self-tight, free from internal rubbing seams, and devoid of organic material that may become detached and permeate the gas. The flexibility and initial resistance of retaining air tends to be an asset in return to certain points of unrestrained release. This arrangement absorbs the vibrations uncontrolled with some construction, like those of standard gasoline, and insulates them to a value that is not so great as in other types.

Teflon tubing remains unaffected by low temperatures which would render any usable form of packing brittle, even have

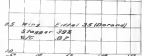
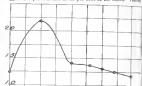
shown that the corners of a Teflon tube may freeze into solid without bursting the metal. In another test at 2.5 lb. air the Teflon tube was put under 120 lb. air pressure, which was made and permanently subjected to a pressure up to a temperature of 70 deg. as change in the pressure indicated in pressure up to 120 lb. during the period of the test, which lasted one year. No weakness or cracking was observed on a 30 in. length of 1/2 in. tubing which was used in a side between two iron plates, the upper one of which was held with 2400 lb. of steel, without any permanent distortion or sagging therefrom.

An important feature of Teflon is that, should it be a substantially airtight, it can readily be repaired by rubbing a lacquer.

Load Distribution and Stagger

By Clarence D. Henneman

The accompanying chart is derived from Delft's experiments with wing section No. 30 as used on the Dornier biplane. The same were carried out using a simplified series of 40 sets of stagger of 0 per cent and of 30 per cent of the chord. Table



COMPARISON OF THE EFFECT OF STAGGER ON WING LOADING

the orthogonal begins gives load distribution as a unit for each inch of span. The increase in the rate due to stagger can be related in the form of a second ratio having a denominator of 1. This second denominator is the one plotted on the chart.

The curve was plotted with the aim that it would serve as a basis, on a very rough way, what effect a fairly large stagger might be expected to have on the load distribution of the given biplane arrangement. In applying the relation of the given load to the given span to that on the lower biplane (shown in the figure) the result is that the load is increased by 10 per cent.

This relation is then multiplied by the effect of the stagger corresponding to the given angle. The product of these ratios indicates roughly what distribution may be expected between the upper and lower planes. The accuracy of this method is also, as may be seen from the further tests will be necessary to show what percentage of error is involved in applying this method to other cases. The lower curve should decrease the value of the denominator in the ratio for any member of the series. On the basis of the tests, when the distribution would decrease rapidly the effect of a change of stagger would also have to be considered. It seems probable, however, that that of used with any other will not cause errors greater than those in other biplane used formulas and charts.

Course in Aerodynamics and Airplane Design

Part III—Experimental Aeronautical Engineering

By Alexander Klemin

Technical Editor, Aviation and Aeronautical Engineering, Consulting Engineer, Aerial Mail Service, Consulting Aeronautical Engineer

Section 2. Testing of Control Surfaces

Copyright, 1928, by Alexander Klemin

Principle of Theoretical Principles—The testing of control surfaces is an easy matter from the point of view of the physical testing, but it is an extremely difficult one from the point of view of determining what loads the surfaces should actually be capable of withstanding.

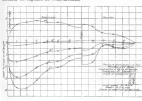


Fig. 1

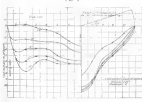


Fig. 2

In dealing with the horizontal tail surfaces, it is necessary to consider that the maximum load on the elevator will be determined by the pilot's strength. This may, however, be open to question as the case of a small machine, where the tail surface load at maximum speed and maximum K_p will never be equal to the pilot's strength.

Because a severe procedure is taken, and tail loads computed from combinations of maximum speed and maximum K_p . This may be unfair to the large ship where the pilot's strength is quite inadequate to produce the necessary displacement of the elevators.

The subject thus begins with difficulty. Probably the most pertinent aerodynamic data on the testing of control surfaces is that obtained at the Massachusetts

Institute of Technology under the direction of the Research Department at McCook Field. Tests were conducted on the Curtiss JN-3, with the stabilizer set at $\alpha = 0$ degrees in the wind, with the elevator set at 4 degrees, 10 degrees up and 10 degrees down in the stabilizer, and at five angles of incidence for the wings, -4 degrees, 0 degrees, 4 degrees, 8 degrees and 15 degrees for the main elevator position. The results of these experiments are summarized in the curves shown in Figs. 1, 2 and 3.

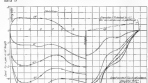


Fig. 3

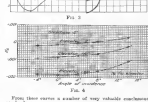


Fig. 4

From these curves a number of very valuable conclusions can be drawn:

- (1) The correct method of loading the elevator so that the load varies from zero at the trailing edge to a maximum at the leading edge seems to be perfectly practical.
- (2) The pressure distribution on the stabilizer is by no means uniform, and there is a definite region of maximum pressure at about 1/3 of the chord from the leading edge, and in such a case no allowance should be made for this.
- (3) For small displacements of the elevator relative to the stabilizer, the more loading on the elevator would appear to be much smaller than the mean loading on the stabilizer. For the larger displacements of the elevators, 10 degrees, as in Fig. 3, the maximum loading at the leading edge of elevator is much larger than the mean loading on the stabilizer, and the mean loading over the elevator is about equal to the mean loading over the stabilizer.

the wing truss, being applied when it is desired to put on a load increment and released at the time when deflections are to be taken. Yaw-strings are employed at the points where deflection measurements are taken.

While testing the elevator and stabilizer, it is also possible to test the entire control system, by connecting up the elevator leads to the joy stick shaft, and fixing the joy stick to position. It is sometimes desirable to connect the joy stick to a spring balance so as to measure the actual deflection caused by the pull for a given load on the elevator.

In the photograph of Fig. 8 is shown a set-up of the vertical tail surfaces. In this case the elevator was previously released, but the stabilizer remains in position.



FIG. 11

TABLE II

Average load, lb.	Deflection, in.				Stress, lb./sq. in.	Remarks
	A	B	C	D		
0-1	1/16	1/16	1/16	1/16	10,000	
1-2	1/8	1/8	1/8	1/8	15,000	
2-3	1/4	1/4	1/4	1/4	20,000	
3-4	3/8	3/8	3/8	3/8	25,000	
4-5	1/2	1/2	1/2	1/2	30,000	
5-6	5/8	5/8	5/8	5/8	35,000	
6-7	3/4	3/4	3/4	3/4	40,000	
7-8	7/8	7/8	7/8	7/8	45,000	
8-9	1	1	1	1	50,000	
9-10	1 1/8	1 1/8	1 1/8	1 1/8	55,000	
10-11	1 1/4	1 1/4	1 1/4	1 1/4	60,000	

Continued

tion, since the vertical fix has to be moved to this. In this case the body is placed on one side, and since the loads on the fix and rollers are not symmetrical relative to the body, it has to be suitably supported to prevent twisting. In the test described in Fig. 12 this was done by placing a post at one side, and tying down on the other side.



FIG. 12. ELEVATOR AND STABILIZER UNDER STRESS

In conducting the test it serves some and trouble (a) to keep a load chart ready before the test, (b) to divide the surface suitably in strips stretched across them, (c) by using the sand in some regular fashion on the ground. In mounting de-

vices of the elevator or stabilizer, it is very important to use an area to the fuselage itself, and to support it by an end on. Also it is necessary to bring back the joy stick to its original position, which can be easily done by tightening up a wire rope holding the spring balance. Thanks to the control can be taken up by the stabilizer. These and other minor

at the attachment of elevator parts and stabilizer parts, and that the main structure of both elevator and stabilizer surfaces are almost always strong enough. Figs. 13, 14, 15 and 16 illustrate a series of representative failures.

Fig. 13 represents a set of horizontal tail surfaces from a two-seater fighter of a gross weight of 3000 lb. and a horse-



FIG. 13. FAILURE OF AN ELEVATOR AT 22.5 LB./SQ. IN.

mountains require some 5 percent in the negative loading of the tail.

It should be noted that in testing the stabilizer and elevator it is necessary to load in the following increments: 5 lb./sq. in., 10 lb./sq. in., 15 lb./sq. in., 20 lb./sq. in., 25 lb./sq. in., 30 lb./sq. in., 35 lb./sq. in., 40 lb./sq. in., 45 lb./sq. in., 50 lb./sq. in., 55 lb./sq. in., 60 lb./sq. in., 65 lb./sq. in., 70 lb./sq. in., 75 lb./sq. in., 80 lb./sq. in., 85 lb./sq. in., 90 lb./sq. in., 95 lb./sq. in., 100 lb./sq. in., 105 lb./sq. in., 110 lb./sq. in., 115 lb./sq. in., 120 lb./sq. in., 125 lb./sq. in., 130 lb./sq. in., 135 lb./sq. in., 140 lb./sq. in., 145 lb./sq. in., 150 lb./sq. in., 155 lb./sq. in., 160 lb./sq. in., 165 lb./sq. in., 170 lb./sq. in., 175 lb./sq. in., 180 lb./sq. in., 185 lb./sq. in., 190 lb./sq. in., 195 lb./sq. in., 200 lb./sq. in., 205 lb./sq. in., 210 lb./sq. in., 215 lb./sq. in., 220 lb./sq. in., 225 lb./sq. in., 230 lb./sq. in., 235 lb./sq. in., 240 lb./sq. in., 245 lb./sq. in., 250 lb./sq. in., 255 lb./sq. in., 260 lb./sq. in., 265 lb./sq. in., 270 lb./sq. in., 275 lb./sq. in., 280 lb./sq. in., 285 lb./sq. in., 290 lb./sq. in., 295 lb./sq. in., 300 lb./sq. in., 305 lb./sq. in., 310 lb./sq. in., 315 lb./sq. in., 320 lb./sq. in., 325 lb./sq. in., 330 lb./sq. in., 335 lb./sq. in., 340 lb./sq. in., 345 lb./sq. in., 350 lb./sq. in., 355 lb./sq. in., 360 lb./sq. in., 365 lb./sq. in., 370 lb./sq. in., 375 lb./sq. in., 380 lb./sq. in., 385 lb./sq. in., 390 lb./sq. in., 395 lb./sq. in., 400 lb./sq. in., 405 lb./sq. in., 410 lb./sq. in., 415 lb./sq. in., 420 lb./sq. in., 425 lb./sq. in., 430 lb./sq. in., 435 lb./sq. in., 440 lb./sq. in., 445 lb./sq. in., 450 lb./sq. in., 455 lb./sq. in., 460 lb./sq. in., 465 lb./sq. in., 470 lb./sq. in., 475 lb./sq. in., 480 lb./sq. in., 485 lb./sq. in., 490 lb./sq. in., 495 lb./sq. in., 500 lb./sq. in., 505 lb./sq. in., 510 lb./sq. in., 515 lb./sq. in., 520 lb./sq. in., 525 lb./sq. in., 530 lb./sq. in., 535 lb./sq. in., 540 lb./sq. in., 545 lb./sq. in., 550 lb./sq. in., 555 lb./sq. in., 560 lb./sq. in., 565 lb./sq. in., 570 lb./sq. in., 575 lb./sq. in., 580 lb./sq. in., 585 lb./sq. in., 590 lb./sq. in., 595 lb./sq. in., 600 lb./sq. in., 605 lb./sq. in., 610 lb./sq. in., 615 lb./sq. in., 620 lb./sq. in., 625 lb./sq. in., 630 lb./sq. in., 635 lb./sq. in., 640 lb./sq. in., 645 lb./sq. in., 650 lb./sq. in., 655 lb./sq. in., 660 lb./sq. in., 665 lb./sq. in., 670 lb./sq. in., 675 lb./sq. in., 680 lb./sq. in., 685 lb./sq. in., 690 lb./sq. in., 695 lb./sq. in., 700 lb./sq. in., 705 lb./sq. in., 710 lb./sq. in., 715 lb./sq. in., 720 lb./sq. in., 725 lb./sq. in., 730 lb./sq. in., 735 lb./sq. in., 740 lb./sq. in., 745 lb./sq. in., 750 lb./sq. in., 755 lb./sq. in., 760 lb./sq. in., 765 lb./sq. in., 770 lb./sq. in., 775 lb./sq. in., 780 lb./sq. in., 785 lb./sq. in., 790 lb./sq. in., 795 lb./sq. in., 800 lb./sq. in., 805 lb./sq. in., 810 lb./sq. in., 815 lb./sq. in., 820 lb./sq. in., 825 lb./sq. in., 830 lb./sq. in., 835 lb./sq. in., 840 lb./sq. in., 845 lb./sq. in., 850 lb./sq. in., 855 lb./sq. in., 860 lb./sq. in., 865 lb./sq. in., 870 lb./sq. in., 875 lb./sq. in., 880 lb./sq. in., 885 lb./sq. in., 890 lb./sq. in., 895 lb./sq. in., 900 lb./sq. in., 905 lb./sq. in., 910 lb./sq. in., 915 lb./sq. in., 920 lb./sq. in., 925 lb./sq. in., 930 lb./sq. in., 935 lb./sq. in., 940 lb./sq. in., 945 lb./sq. in., 950 lb./sq. in., 955 lb./sq. in., 960 lb./sq. in., 965 lb./sq. in., 970 lb./sq. in., 975 lb./sq. in., 980 lb./sq. in., 985 lb./sq. in., 990 lb./sq. in., 995 lb./sq. in., 1000 lb./sq. in., 1005 lb./sq. in., 1010 lb./sq. in., 1015 lb./sq. in., 1020 lb./sq. in., 1025 lb./sq. in., 1030 lb./sq. in., 1035 lb./sq. in., 1040 lb./sq. in., 1045 lb./sq. in., 1050 lb./sq. in., 1055 lb./sq. in., 1060 lb./sq. in., 1065 lb./sq. in., 1070 lb./sq. in., 1075 lb./sq. in., 1080 lb./sq. in., 1085 lb./sq. in., 1090 lb./sq. in., 1095 lb./sq. in., 1100 lb./sq. in., 1105 lb./sq. in., 1110 lb./sq. in., 1115 lb./sq. in., 1120 lb./sq. in., 1125 lb./sq. in., 1130 lb./sq. in., 1135 lb./sq. in., 1140 lb./sq. in., 1145 lb./sq. in., 1150 lb./sq. in., 1155 lb./sq. in., 1160 lb./sq. in., 1165 lb./sq. in., 1170 lb./sq. in., 1175 lb./sq. in., 1180 lb./sq. in., 1185 lb./sq. in., 1190 lb./sq. in., 1195 lb./sq. in., 1200 lb./sq. in., 1205 lb./sq. in., 1210 lb./sq. in., 1215 lb./sq. in., 1220 lb./sq. in., 1225 lb./sq. in., 1230 lb./sq. in., 1235 lb./sq. in., 1240 lb./sq. in., 1245 lb./sq. in., 1250 lb./sq. in., 1255 lb./sq. in., 1260 lb./sq. in., 1265 lb./sq. in., 1270 lb./sq. in., 1275 lb./sq. in., 1280 lb./sq. in., 1285 lb./sq. in., 1290 lb./sq. in., 1295 lb./sq. in., 1300 lb./sq. in., 1305 lb./sq. in., 1310 lb./sq. in., 1315 lb./sq. in., 1320 lb./sq. in., 1325 lb./sq. in., 1330 lb./sq. in., 1335 lb./sq. in., 1340 lb./sq. in., 1345 lb./sq. in., 1350 lb./sq. in., 1355 lb./sq. in., 1360 lb./sq. in., 1365 lb./sq. in., 1370 lb./sq. in., 1375 lb./sq. in., 1380 lb./sq. in., 1385 lb./sq. in., 1390 lb./sq. in., 1395 lb./sq. in., 1400 lb./sq. in., 1405 lb./sq. in., 1410 lb./sq. in., 1415 lb./sq. in., 1420 lb./sq. in., 1425 lb./sq. in., 1430 lb./sq. in., 1435 lb./sq. in., 1440 lb./sq. in., 1445 lb./sq. in., 1450 lb./sq. in., 1455 lb./sq. in., 1460 lb./sq. in., 1465 lb./sq. in., 1470 lb./sq. in., 1475 lb./sq. in., 1480 lb./sq. in., 1485 lb./sq. in., 1490 lb./sq. in., 1495 lb./sq. in., 1500 lb./sq. in., 1505 lb./sq. in., 1510 lb./sq. in., 1515 lb./sq. in., 1520 lb./sq. in., 1525 lb./sq. in., 1530 lb./sq. in., 1535 lb./sq. in., 1540 lb./sq. in., 1545 lb./sq. in., 1550 lb./sq. in., 1555 lb./sq. in., 1560 lb./sq. in., 1565 lb./sq. in., 1570 lb./sq. in., 1575 lb./sq. in., 1580 lb./sq. in., 1585 lb./sq. in., 1590 lb./sq. in., 1595 lb./sq. in., 1600 lb./sq. in., 1605 lb./sq. in., 1610 lb./sq. in., 1615 lb./sq. in., 1620 lb./sq. in., 1625 lb./sq. in., 1630 lb./sq. in., 1635 lb./sq. in., 1640 lb./sq. in., 1645 lb./sq. in., 1650 lb./sq. in., 1655 lb./sq. in., 1660 lb./sq. in., 1665 lb./sq. in., 1670 lb./sq. in., 1675 lb./sq. in., 1680 lb./sq. in., 1685 lb./sq. in., 1690 lb./sq. in., 1695 lb./sq. in., 1700 lb./sq. in., 1705 lb./sq. in., 1710 lb./sq. in., 1715 lb./sq. in., 1720 lb./sq. in., 1725 lb./sq. in., 1730 lb./sq. in., 1735 lb./sq. in., 1740 lb./sq. in., 1745 lb./sq. in., 1750 lb./sq. in., 1755 lb./sq. in., 1760 lb./sq. in., 1765 lb./sq. in., 1770 lb./sq. in., 1775 lb./sq. in., 1780 lb./sq. in., 1785 lb./sq. in., 1790 lb./sq. in., 1795 lb./sq. in., 1800 lb./sq. in., 1805 lb./sq. in., 1810 lb./sq. in., 1815 lb./sq. in., 1820 lb./sq. in., 1825 lb./sq. in., 1830 lb./sq. in., 1835 lb./sq. in., 1840 lb./sq. in., 1845 lb./sq. in., 1850 lb./sq. in., 1855 lb./sq. in., 1860 lb./sq. in., 1865 lb./sq. in., 1870 lb./sq. in., 1875 lb./sq. in., 1880 lb./sq. in., 1885 lb./sq. in., 1890 lb./sq. in., 1895 lb./sq. in., 1900 lb./sq. in., 1905 lb./sq. in., 1910 lb./sq. in., 1915 lb./sq. in., 1920 lb./sq. in., 1925 lb./sq. in., 1930 lb./sq. in., 1935 lb./sq. in., 1940 lb./sq. in., 1945 lb./sq. in., 1950 lb./sq. in., 1955 lb./sq. in., 1960 lb./sq. in., 1965 lb./sq. in., 1970 lb./sq. in., 1975 lb./sq. in., 1980 lb./sq. in., 1985 lb./sq. in., 1990 lb./sq. in., 1995 lb./sq. in., 2000 lb./sq. in., 2005 lb./sq. in., 2010 lb./sq. in., 2015 lb./sq. in., 2020 lb./sq. in., 2025 lb./sq. in., 2030 lb./sq. in., 2035 lb./sq. in., 2040 lb./sq. in., 2045 lb./sq. in., 2050 lb./sq. in., 2055 lb./sq. in., 2060 lb./sq. in., 2065 lb./sq. in., 2070 lb./sq. in., 2075 lb./sq. in., 2080 lb./sq. in., 2085 lb./sq. in., 2090 lb./sq. in., 2095 lb./sq. in., 2100 lb./sq. in., 2105 lb./sq. in., 2110 lb./sq. in., 2115 lb./sq. in., 2120 lb./sq. in., 2125 lb./sq. in., 2130 lb./sq. in., 2135 lb./sq. in., 2140 lb./sq. in., 2145 lb./sq. in., 2150 lb./sq. in., 2155 lb./sq. in., 2160 lb./sq. in., 2165 lb./sq. in., 2170 lb./sq. in., 2175 lb./sq. in., 2180 lb./sq. in., 2185 lb./sq. in., 2190 lb./sq. in., 2195 lb./sq. in., 2200 lb./sq. in., 2205 lb./sq. in., 2210 lb./sq. in., 2215 lb./sq. in., 2220 lb./sq. in., 2225 lb./sq. in., 2230 lb./sq. in., 2235 lb./sq. in., 2240 lb./sq. in., 2245 lb./sq. in., 2250 lb./sq. in., 2255 lb./sq. in., 2260 lb./sq. in., 2265 lb./sq. in., 2270 lb./sq. in., 2275 lb./sq. in., 2280 lb./sq. in., 2285 lb./sq. in., 2290 lb./sq. in., 2295 lb./sq. in., 2300 lb./sq. in., 2305 lb./sq. in., 2310 lb./sq. in., 2315 lb./sq. in., 2320 lb./sq. in., 2325 lb./sq. in., 2330 lb./sq. in., 2335 lb./sq. in., 2340 lb./sq. in., 2345 lb./sq. in., 2350 lb./sq. in., 2355 lb./sq. in., 2360 lb./sq. in., 2365 lb./sq. in., 2370 lb./sq. in., 2375 lb./sq. in., 2380 lb./sq. in., 2385 lb./sq. in., 2390 lb./sq. in., 2395 lb./sq. in., 2400 lb./sq. in., 2405 lb./sq. in., 2410 lb./sq. in., 2415 lb./sq. in., 2420 lb./sq. in., 2425 lb./sq. in., 2430 lb./sq. in., 2435 lb./sq. in., 2440 lb./sq. in., 2445 lb./sq. in., 2450 lb./sq. in., 2455 lb./sq. in., 2460 lb./sq. in., 2465 lb./sq. in., 2470 lb./sq. in., 2475 lb./sq. in., 2480 lb./sq. in., 2485 lb./sq. in., 2490 lb./sq. in., 2495 lb./sq. in., 2500 lb./sq. in., 2505 lb./sq. in., 2510 lb./sq. in., 2515 lb./sq. in., 2520 lb./sq. in., 2525 lb./sq. in., 2530 lb./sq. in., 2535 lb./sq. in., 2540 lb./sq. in., 2545 lb./sq. in., 2550 lb./sq. in., 2555 lb./sq. in., 2560 lb./sq. in., 2565 lb./sq. in., 2570 lb./sq. in., 2575 lb./sq. in., 2580 lb./sq. in., 2585 lb./sq. in., 2590 lb./sq. in., 2595 lb./sq. in., 2600 lb./sq. in., 2605 lb./sq. in., 2610 lb./sq. in., 2615 lb./sq. in., 2620 lb./sq. in., 2625 lb./sq. in., 2630 lb./sq. in., 2635 lb./sq. in., 2640 lb./sq. in., 2645 lb./sq. in., 2650 lb./sq. in., 2655 lb./sq. in., 2660 lb./sq. in., 2665 lb./sq. in., 2670 lb./sq. in., 2675 lb./sq. in., 2680 lb./sq. in., 2685 lb./sq. in., 2690 lb./sq. in., 2695 lb./sq. in., 2700 lb./sq. in., 2705 lb./sq. in., 2710 lb./sq. in., 2715 lb./sq. in., 2720 lb./sq. in., 2725 lb./sq. in., 2730 lb./sq. in., 2735 lb./sq. in., 2740 lb./sq. in., 2745 lb./sq. in., 2750 lb./sq. in., 2755 lb./sq. in., 2760 lb./sq. in., 2765 lb./sq. in., 2770 lb./sq. in., 2775 lb./sq. in., 2780 lb./sq. in., 2785 lb./sq. in., 2790 lb./sq. in., 2795 lb./sq. in., 2800 lb./sq. in., 2805 lb./sq. in., 2810 lb./sq. in., 2815 lb./sq. in., 2820 lb./sq. in., 2825 lb./sq. in., 2830 lb./sq. in., 2835 lb./sq. in., 2840 lb./sq. in., 2845 lb./sq. in., 2850 lb./sq. in., 2855 lb./sq. in., 2860 lb./sq. in., 2865 lb./sq. in., 2870 lb./sq. in., 2875 lb./sq. in., 2880 lb./sq. in., 2885 lb./sq. in., 2890 lb./sq. in., 2895 lb./sq. in., 2900 lb./sq. in., 2905 lb./sq. in., 2910 lb./sq. in., 2915 lb./sq. in., 2920 lb./sq. in., 2925 lb./sq. in., 2930 lb./sq. in., 2935 lb./sq. in., 2940 lb./sq. in., 2945 lb./sq. in., 2950 lb./sq. in., 2955 lb./sq. in., 2960 lb./sq. in., 2965 lb./sq. in., 2970 lb./sq. in., 2975 lb./sq. in., 2980 lb./sq. in., 2985 lb./sq. in., 2990 lb./sq. in., 2995 lb./sq. in., 3000 lb./sq. in., 3005 lb./sq. in., 3010 lb./sq. in., 3015 lb./sq. in., 3020 lb./sq. in., 3025 lb./sq. in., 3030 lb./sq. in., 3035 lb./sq. in., 3040 lb./sq. in., 3045 lb./sq. in., 3050 lb./sq. in., 3055 lb./sq. in., 3060 lb./sq. in., 3065 lb./sq. in., 3070 lb./sq. in., 3075 lb./sq. in., 3080 lb./sq. in., 3085 lb./sq. in., 3090 lb./sq. in., 3095 lb./sq. in., 3100 lb./sq. in., 3105 lb./sq. in., 3110 lb./sq. in., 3115 lb./sq. in., 3120 lb./sq. in., 3125 lb./sq. in., 3130 lb./sq. in., 3135 lb./sq. in., 3140 lb./sq. in., 3145 lb./sq. in., 3150 lb./sq. in., 3155 lb./sq. in., 3160 lb./sq. in., 3165 lb./sq. in., 3170 lb./sq. in., 3175 lb./sq. in., 3180 lb./sq. in., 3185 lb./sq. in., 3190 lb./sq. in., 3195 lb./sq. in., 3200 lb./sq. in., 3205 lb./sq. in., 3210 lb./sq. in., 3215 lb./sq. in., 3220 lb./sq. in., 3225 lb./sq. in., 3230 lb./sq. in., 3235 lb./sq. in., 3240 lb./sq. in., 3245 lb./sq. in., 3250 lb./sq. in., 3255 lb./sq. in., 3260 lb./sq. in., 3265 lb./sq. in., 3270 lb./sq. in., 3275 lb./sq. in., 3280 lb./sq. in., 3285 lb./sq. in., 3290 lb./sq. in., 3295 lb./sq. in., 3300 lb./sq. in., 3305 lb./sq. in., 3310 lb./sq. in., 3315 lb./sq. in., 3320 lb./sq. in., 3325 lb./sq. in., 3330 lb./sq. in., 3335 lb./sq. in., 3340 lb./sq. in., 3345 lb./sq. in., 3350 lb./sq. in., 3355 lb./sq. in., 3360 lb./sq. in., 3365 lb./sq. in., 3370 lb./sq. in., 3375 lb./sq. in., 3380 lb./sq. in., 3385 lb./sq. in., 3390 lb./sq. in., 3395 lb./sq. in., 3400 lb./sq. in., 3405 lb./sq. in., 3410 lb./sq. in., 3415 lb./sq. in., 3420 lb./sq. in., 3425 lb./sq. in., 3430 lb./sq. in., 3435 lb./sq. in., 3440 lb./sq. in., 3445 lb./sq. in., 3450 lb./sq. in., 3455 lb./sq. in., 3460 lb./sq. in., 3465 lb./sq. in., 3470 lb./sq. in., 3475 lb./sq. in., 3480 lb./sq. in., 3485 lb./sq. in., 3490 lb./sq. in., 3495 lb./sq. in., 3500 lb./sq. in., 3505 lb./sq. in., 3510 lb./sq. in., 3515 lb./sq. in., 3520 lb./sq. in., 3525 lb./sq. in., 3530 lb./sq. in., 3535 lb./sq. in., 3540 lb./sq. in., 3545 lb./sq. in., 3550 lb./sq. in., 3555 lb./sq. in., 3560 lb./sq. in., 3565 lb./sq. in., 3570 lb./sq. in., 3575 lb./sq. in., 3580 lb./sq. in., 3585 lb./sq. in., 3590 lb./sq. in., 3595 lb./sq. in., 3600 lb./sq. in., 3605 lb./sq. in., 3610 lb./sq. in., 3615 lb./sq. in., 3620 lb./sq. in., 3625 lb./sq. in., 3630 lb./sq. in., 3635 lb./sq. in., 3640 lb./sq. in., 3645 lb./sq. in., 3650 lb./sq. in., 3655 lb./sq. in., 3660 lb./sq. in., 3665 lb./sq. in., 3670 lb./sq. in., 3675 lb./sq. in., 3680 lb./sq. in., 3685 lb./sq. in., 3690 lb./sq. in., 3695 lb./sq. in., 3700 lb./sq. in., 3705 lb./sq. in., 3710 lb./sq. in., 3715 lb./sq. in., 3720 lb./sq. in., 3725 lb./sq. in., 3730 lb./sq. in., 3735 lb./sq. in., 3740 lb./sq. in., 3745 lb./sq. in., 3750 lb./sq. in., 3755 lb./sq. in., 3760 lb./sq. in., 3765 lb./sq. in., 3770 lb./sq. in., 3775 lb./sq. in., 3780 lb./sq. in., 3785 lb./sq. in., 3790 lb./sq. in., 3795 lb./sq. in., 3800 lb./sq. in., 3805 lb./sq. in., 3810 lb./sq. in., 3815 lb./sq. in., 3820 lb./sq. in., 3825 lb./sq. in., 3830 lb./sq. in., 3835 lb./sq. in., 3840 lb./sq. in., 3845 lb./sq. in., 3850 lb./sq. in., 3855 lb./sq. in., 3860 lb./sq. in., 3865 lb./sq. in., 3870 lb./sq. in., 3875 lb./sq. in., 3880 lb./sq. in., 3885 lb./sq. in., 3890 lb./sq. in., 3895 lb./sq. in., 3900 lb./sq. in., 3905 lb./sq. in., 3910 lb./sq. in., 3915 lb./sq. in., 3920 lb./sq. in., 3925 lb./sq. in., 3930 lb./sq. in., 3935 lb./sq. in., 3940 lb./sq. in., 3945 lb./sq. in., 3950 lb./sq. in., 3955 lb./sq. in., 3960 lb./sq. in., 3965 lb./sq. in., 3970 lb./sq. in., 3975 lb./sq. in., 3980 lb./sq. in., 3985 lb./sq. in., 3990 lb./sq. in., 3995 lb./sq. in., 4000 lb./sq. in., 4005 lb./sq. in., 4010 lb./sq. in., 4015 lb./sq. in., 4020 lb./sq. in., 4025 lb./sq. in., 4030 lb./sq. in., 4035 lb./sq. in., 4040 lb./sq. in., 4045 lb./sq. in., 4050 lb./sq. in., 4055 lb./sq. in., 4060 lb./sq. in., 4065 lb./sq. in., 4070 lb./sq. in., 4075 lb./sq. in., 4080 lb./sq. in., 4085 lb./sq. in., 4090 lb./sq. in., 4095 lb./sq. in., 4100 lb./sq. in., 4105 lb./sq. in., 4110 lb./sq. in., 4115 lb./sq. in., 4120 lb./sq. in., 4125 lb./sq. in., 4130 lb./sq. in., 4135 lb./sq. in., 4140 lb./sq. in., 4145 lb./sq. in., 4150 lb./sq. in., 4155 lb./sq. in., 4160 lb./sq. in., 4165 lb./sq. in., 4170 lb./sq. in., 4175 lb./sq. in., 4180 lb./sq. in., 4185 lb./sq. in., 4190 lb./sq. in., 4195 lb./sq. in., 4200 lb./sq. in., 4205 lb./sq. in., 4210 lb./sq. in., 4215 lb./sq. in., 4220 lb./sq. in., 4225 lb./sq. in., 4230 lb./sq. in., 4235 lb./sq. in., 4240 lb./sq. in., 4245 lb./sq. in., 4250 lb./sq. in., 4255 lb./sq. in., 4260 lb./sq. in., 4265 lb./sq. in., 4270 lb./sq. in., 4275 lb./sq. in., 4280 lb./sq. in., 4285 lb./sq. in., 4290 lb./sq. in., 4295 lb./sq. in., 4300 lb./sq. in., 4305 lb./sq. in., 4310 lb./sq. in., 4315 lb./sq. in., 4320 lb./sq. in., 4325 lb./sq. in., 4330 lb./sq. in., 4335 lb./sq. in., 4340 lb./sq. in., 4345 lb./sq. in., 4350 lb./sq. in., 4355 lb./sq. in., 4360 lb./sq. in., 4365 lb./sq. in., 4370 lb./sq. in., 4375 lb./sq. in., 4380 lb./sq. in., 4385 lb./sq. in., 4390 lb./sq. in., 4395 lb./sq. in., 4400 lb./sq. in., 4405 lb./sq. in., 4410 lb./sq. in., 4415 lb./sq. in., 4420 lb./sq. in., 4425 lb./sq. in., 4430 lb./sq. in., 4435 lb./sq. in., 4440 lb./sq. in., 4445 lb./sq. in., 4450 lb./sq. in., 4455 lb./sq. in., 4460 lb./sq. in., 4465 lb./sq. in., 4470 lb./sq. in., 4475 lb./sq. in., 4480 lb./sq. in., 4485 lb./sq. in., 4490 lb./sq. in., 4495 lb./sq. in., 4500 lb./sq. in., 4505 lb./sq. in., 4510 lb./sq. in., 4515 lb./sq. in., 4520 lb./sq. in., 4525 lb./sq. in., 4530 lb./sq. in., 4535 lb./sq. in., 4540 lb./sq. in., 4545 lb./sq. in., 4550 lb./sq. in., 4555 lb./sq. in., 4560 lb./sq. in., 4565 lb./sq. in., 4570 lb./sq. in., 4575 lb./sq. in., 4580 lb./sq. in., 4585 lb./sq. in., 4590 lb./sq. in., 4595 lb./sq. in., 4600 lb./sq. in., 4605 lb./sq. in., 4610 lb./sq. in., 4615 lb./sq. in., 4620 lb./sq. in., 4625 lb./sq. in., 4630 lb./sq. in.,

News of the Fortnight

New Programs for Air Service

A new program for the development of the Air Service on a permanent basis has been announced by the War Department. This plan provides for 3,500 planes of all types, 3,700 in active commission and 3,600 in reserve. This is based upon the proposed secondary establishment of 500,000 men, in which total the Air Service personnel will be 1,600 officers and 21,853 men.

The organization tables show the air forces on a peace basis will comprise eighty-seven service squadrons, of which forty-two will be assigned to coast defense work in the United States and similar positions, twenty will be patrol squadrons and twenty-five observation and bombing squadrons. The typical army airplane squadron includes eighteen planes in groups and three personnel.

The tables also call for maintenance of sixty-two balloons companies, divided into three wings of fourteen companies each.

[illegible]

The effects of this will be to give the Air Service definite preposition as the fourth arm of the line, or combat force of the Army, the others being infantry, cavalry, and artillery. All other units are supplemental forces, generally known as auxiliary arms or staff corps troops.

Storage capacity has been provided for approximately 4,000 complete planes, not including those in service or in symbolic reserve with the squadron. In addition, airplane engines in the thousand have been stored, the upper end of any unit in service requiring three or four extra engines a plane.

To make this plan effective, it will require the purchase by the Government of several thousand airplanes of types which the Air Service does not at present own. Bombing planes, engine-driven fighters and two-seater fighters will be needed.

The present DH-4 will have to be remodelled to bring it up to date for observation and photographic work. Advanced training types will also probably be needed.

To secure the above equipment will require so new legislation for these are funds available from present appropriations to cover the cost of the new machines.

Paris Air Conference

The Aeronautical Commission of the Peace Conference held a meeting in Paris, March 31, to receive and consider reports from sub-committees concerning military, legal, economic and technical subjects. It was found that the sub-committees had not completed their work, but the commission approved the temporary reports submitted.

It was agreed to put before the Supreme Council the proposals to be finally submitted at the next meeting by the joint military and legal sub-committee. Good progress has been reached on important points in connection with the future of commercial aviation.

At the next meeting of the Commission it is expected that the general principles and much of the detail of the entire Allied Aerial Campaign may be settled finally.

New York Police Air Fares

The New York Police Department has taken active steps to form an aviation section of the Police Reserve under Deputy Commissioner Holloman Wamsucker. Col. Jefferson De Mont Thompson is in command of the air force.

[illegible]

New Products Tested

According to the Early Field Eagle, a new type of parasite, which is the invention of First Lord Solomon I. The Master, A. B., has successfully been tested at Walbur Wagon Road.

Later Van Meter's invention is used to mark a great of canvas upon the old system of jumping from the plane was the parachute packed on the back of the pilot. The old method was unsatisfactory because the pilot would often experience difficulty in clearing the ship, and the parachute would become entangled in the tail of the ship, especially in the case of a tailspin. It was also unsafe to jump by the old way from a height of less than several hundred feet, as the parachute often fell that far before opening.

The Van Meter parachute increases these drawbacks by the following means: The parachute, which is enclosed within an aluminum container, is placed in the airplane body directly behind the nose cockpit. Under the container is a powerful spring, which, when released through the parachute's distance of at least twenty feet from the ship, at which time the parachute immediately opens and slows the pilot from the ship. At the same time the pilot releases the spring which discharges the aluminum cartridge, the pilot himself is safe.

When he is released, the seat falls back a short distance against a stopway and makes his departure from the ship less abrupt. The spring is easily released by pulling a ring fastened on either side of the seat's seat.

Further experiments will be conducted at Murok Field. Lieutenant Van Meter having been assigned to duty in connection with the Aircraft Engineering Department.

Antagonism of Cytosolic Arginine Kinase

At the Second Pan-American Aeronautics Convention to be held at Atlantic City in May many prizes will be competed for and several asked there have indicated their intention of participating in the contests.

Capt. William A. Bishop has offered a trophy to be known as the *Age of Ages* trophy, to be awarded in 1910 to the first who makes the best speed between Toronto and Atlantic City.

The Atlantic City Aces Club has offered \$50,000 to the pilot who begins or ends a transatlantic flight at Atlantic City during the month of May.

The Valentine group has members around 10 #1000 and are to go to the pool who makes the greatest number of laps between Atlantic City and Cape May. Naval Air Station does not like the competition.

Queen M. Carole has offered a \$2500 prize to the first girl who has 1000 sales without shopping at malls for the Christmas season. Queen Maudie.

Speed prices for airplanes, to be competitive for use May 21, averaged \$1759.

\$2,000 is offered for the summer of intercollegiate tennis.

Service Association Mayors

The publication office of U. S. Air Service and the office of the Army and Navy Air Service Association have been moved from Building D, 4th and B Streets, Washington, D. C., to the new building at 1000 14th Street, N. W., Washington, D. C.

This new horizon will be a consequence to the horizon in trends of the association and particularly the magazine. Members of the association, as well as prospective members, will benefit from this.

The secretaries, Capt Earl S. Findley, A. S. A., and Lieutenant Menck and Mitroff, who have been detailed as members of the magazine staff, are now located in the new office.

E. Robinson Davis Sports Academy

The best reported sale of a small sporting airplane for inflation work was recently made by the Aircraft Development Corp. of New York, when they sold one of their ACE models to Aviator Eddie Stinson, of the famous Stinson family of Ohio. Before purchasing the plane Stinson put the mail machine through all the tests for which he is famous. It will see it through the narrowest free-inflation route.

A vintage advertisement for Curtiss. At the top, a framed picture shows a ship at sea. Below the frame, the word "Curtiss" is written in a large, elegant script font. Underneath the name, the text "THE AFTERNOON" is visible. At the bottom, a biplane is shown on a beach, with a person standing next to it. The background is filled with clouds.

HUMAN RIGHTS MAIL IN BLINDING SQUALL

Appeared in The New York Times

WASHINGTON, March 24.—A cyclone, blasted by
perpetual snow and rain, howled from the
north, blinding the New York Herald Tribune
from Philadelphia in New York. His afternoon number
the longest, with some of the blindest material
collected in the snow.

after

CURTIS AEROPLANE AND MOTOR CORPORATION, Sales Office 34 Varianway Ave., New York City
CURTIS ENGINE & MOTOR CO., 1000 City Hall Bldg. YER ENGINE COMPANY, Montreal, Que.
Aircraft Maintenance  Aircraft Association

	<p>THOMAS-MORSE</p> <p><i>Side-by-Side Seater, Type S-7</i></p> <p>Equipped with 80 h. p. Le Rhone Engine</p> <p>High speed, 90 M. P. H.</p> <p>Landing speed, 35 M. P. H.</p> <p>Climb 5,700 ft. in first ten minutes.</p>
<p>THOMAS-MORSE AIRCRAFT CORPORATION</p> <p>ITHACA, N. Y., U. S. A.</p>	

Beardmore

Aero Engines

The Supremacy of "Beardmore" is beyond dispute.

- ¶ The late Col. Cady on his bi-plane beat all comers, both British and Foreign, the Engine used was Beardmore design. **SIMILAR ENGINES BUILT PRE-WAR DAYS ARE STILL IN ACTIVE SERVICE.**
 - ¶ During the past four years of hostilities, Beardmore Engines have been in constant use on all fronts. Any member of the R. A. F. will testify to Beardmore quality, efficiency and reliability.
 - ¶ Beardmore Six Cylinder, Vertical, 120 and 160 H. P. Engines are Engines of experience and for commercial work will prove the best investment.
- Inquiries invited regarding U. S. A. and Canadian representatives*
- THE BEARDMORE AERO ENGINE, LIMITED**
- London Showrooms and Depot — 112 Great Portland Street, London, W. 1

PAGE

TO RETIRED SERVICE FLEETS
with tribute to
"WALT HEASON"
of the A. 1. Avenue Club

You played your part and did your share—perhaps over here, perhaps over there—and here like most of us, don't seem the same. You hang around the dear old shop, and say "Good bye" with your rag lip and wave us back to Bells' or Bells' (Gosh! it was good, never I-P THERE)—and now you're groggy, sore and plain and thank the world's gone on the beach. Chase up, old tops, it isn't so bad for there's good news to make you glad and comes from North, South, East and West—BELLANCA'S. 'TIS for the best—BELLANCA'S 'TIS has shown how soon the flying game is tuned to home; ere long the shores will tell the tale how sky-high enterprise can't fail—with you at work with work galore (all you can do and then some more). 'Twould take too long to tell it here, but just to prove the news' sincere, just on down now and write a line, address it "No two more more," and say just what you'd like to do and see if wishes can't come true!

SAFETY! ECONOMY!! EFFICIENCY!!!

and a picture to look at



THE BELLANCA 55 H.P. ANZANI TWO-SEATER BIPLANE

Price Complete \$3,500 F.O.B.



THE AEROPLANE AVERAGE MAN

The Specifications and Photos of this machine
HARRY E. THOMAS
Sales Manager
100 Madison Avenue
New York City



a counterbalanced aviation crankshaft

Patented July 1914, 1927

one of the 18 different models we are now making for 14 aviation motor companies . . . reduces vibration and eliminates bearing pressure

We have shipped 16,317 Aviation Crankshafts to January 14, 1938

THE PARK DROP FORGE CO. CLEVELAND, OHIO



**ACKERMAN
LANDING
GEAR**

Lightest and highest speed, most
thrusting, traction, landing gear

has
**SIMPLICITY
STRENGTH
and SERVICE**

made for the Air
to

THE ACKERMAN WHEEL COMPANY
542 Rockefeller Building, CLEVELAND, OHIO, U.S.A.



"THE SHARK" Fighting Bomber

L.W.F. ENGINEERING COMPANY
Inc.
COLLEGE POINT, L. I.





**ERIE STANDARD
AIRCRAFT METAL PARTS**

**DEPENDABLE SERVICE
QUANTITY-PRODUCTION**

Our plant at Erie—the largest of its kind—operates on AIRCRAFT
SCREWS, BOLTS AND GLASS FIBER conforming to Government
Specifications.

A product so easy, sure, perfect in quality and machine process as the
human element will permit.

Please request our New York Office to send you copy of our catalogue.

ERIE SPECIALTY CO
Erie, Pennsylvania
NY Office 8 West 40th St.

WE USE THE CELEBRATED

LUMA Radium
Luminous
Compound

**To Manufacturers of
Aeronautic Instruments**

The great volume of work handled by our
various factories involves a breadth of dial
painting experience that warrants consid-
eration of our service from the standpoint
of both technique and economy.

We use only Luma, the world's best Ra-
dium luminous material.

Estimates and full information upon request.

RADIUM DIAL CO.
GENERAL OFFICES—PITTSBURGH, PA.
MILWAUKEE, CHICAGO, ST. LOUIS, PHILADELPHIA, NEW YORK, BOSTON, WASHINGTON, D.C.,
SAN FRANCISCO, LOS ANGELES, SAN DIEGO, SAN JOSE, CALIF.

**FILES
DRILLS
TAPS and DIES
MACHINISTS' TOOLS
BOLTS and SCREWS
FACTORY SUPPLIES
Etc., Etc.**

IN this period of reconstruction it is more important than ever to keep up the stock in your storerooms—have the gaps filled in and leveled off—to be prepared to better meet the new conditions as they develop and the competition which is sure to come.

We are ready for you with a large and assorted line of

**General Hardware
Tools and
Factory Supplies**

and solicit an opportunity to figure on your requirements.

**HAMMACHER,
SCHLEMMER & CO.**

Hardware, Tools and Factory Supplies

4th Ave. & 12th St. New York Since 1848

AIRCRAFT JOURNAL

Formerly Air Service Journal

THE "National Aeronautic Weekly" which covers accurately and thoroughly all the news of aeronautics the world over.

Fifty-two consecutive issues of *Aircraft Journal* means a record of all happenings aeronautic for a year.

A year's subscription to *Aircraft Journal* is two dollars. A six months' trial subscription is one dollar.

AIRCRAFT JOURNAL
22 East Seventeenth St.
New York City

Delivered by Mail



AJAX Auto and Aero Sheet Metal Company
Manufacturers and dealers of
**AERO RADIATOR INTAKE
and EXHAUST PIPES**
11 W. 42ND ST., NEW YORK CITY, N. Y.



Aluminum Company of America

General Sales Office, 2000 Globe Building
PITTSBURGH, PA.

Producers of Aluminum

Manufacturers of

Electrical Conductors
for Industrial, Railway and Commercial Power Distribution

also
**Ingot, Sheet, Tubing, Rod, Rivets,
Moulding, Extruded Shapes**

also
Litot Aluminum Solders and Flux

CANADA
Northern Aluminum Co., Ltd., Toronto
ENGLAND
Northern Aluminum Co., Ltd., London
LATIN AMERICA
Alumina Co. of South America, Pittsburgh, Pa.

"DALTON SIX"
METAL WORKING
Automatic Lathe
MODEL TYPE "D-6"
30 inch swing, 12 inch lathe

DALTON MANUFACTURING CORPORATION
NEW YORK, U.S.A. - CHASE BUILDING - NEW YORK



No. 10 FLAIN MILLER

Single Pulley Drive

11 changes in speeds possible
4 changes in speeds possible
Horizontal machine and gear changeover
We also build Universal Milling, Drilling, Boring
Vertical lathe and other types.

THE FOX MACHINE COMPANY
1815 W. Casson St., Jackson, Mich.
Pioneers of Great Rapids, Mich.

SPRUCE LUMBER

for
Airplane Construction

FOR twenty years we have been exclusive manufacturers of PACIFIC COAST SPRUCE LUMBER. Our product is from the very best forests of SITKA SPRUCE.

We solicit your inquiries

MULTNOMAH LUMBER
& BOX COMPANY

PORTLAND

OREGON

DIXON'S ELDORADO

The master drawing pencil

A National Service

During the war, when most pencils for the bulk of war—Dixon's Eldorado, "the master drawing pencil"—rendered some National Service.

Today it is giving the same service, contributing to the needs of peace.

Smooth, strong, firm and long lasting, leads to uniformly perfect, makes the Eldorado a real drawing instrument. Made in 17 degrees—48 degrees to 90 degrees with H.B. (pencil) for general use.

It is to be expected that you will find the Eldorado pencil a real drawing pencil. It is to be expected that you will find the Eldorado pencil a real drawing pencil.

JOHN DIXON CRUCIBLE CO.
Established 1837
New York City, U. S. A.

There is a Dixon drawing pencil pencil, and more for every pencil.

HIGHER THAN THE HIGHEST MOUNTAIN



Castrol

Castrol is the world's highest altitude motor oil. It is the only oil that can be used in the highest altitudes. It is the only oil that can be used in the highest altitudes. It is the only oil that can be used in the highest altitudes.

Castrol is the world's highest altitude motor oil. It is the only oil that can be used in the highest altitudes. It is the only oil that can be used in the highest altitudes. It is the only oil that can be used in the highest altitudes.

Castrol is the world's highest altitude motor oil. It is the only oil that can be used in the highest altitudes. It is the only oil that can be used in the highest altitudes. It is the only oil that can be used in the highest altitudes.



All the experience of this organization in the manufacture of speed indicating and recording instruments, is available to the manufacturer with a problem in this field of airplane accessory apparatus.

Correspondence is invited
R. W. JOHNS-MANVILLE CO.
New York City
34 West 42nd Street in 34 West 42nd

JOHNS-MANVILLE

Speed Indicating and Recording
Aeronautic Instruments



Baker's A-A Castor Oil

Specialty Refined
for the Lubrication of
AERONAUTICAL MOTORS

BAKER CASTOR OIL CO.
Incorporated 1937
The Oldest and Largest Manufacturers
of Castor Oil in the United States
120 BROADWAY - NEW YORK

FUEL LEVEL GAGES



This cut shows our Model 51 Gage which is standard on practically all type of military training machines.

Other types of gages in large quantities are "doing their best" as part of the equipment of English Government Warplanes.

SPECIAL OFFER: DISCOUNT FOR YOUR SPECIAL ORDER

BOSTON AUTO GAGE CO.

8 WALTHAM STREET, BOSTON, MASS.

WITTEMAN-LEWIS AIRCRAFT COMPANY

NEWARK, N. J.

Meets Office and Factory

Lincoln Highway near Passaic River

Telephone, Market 9266

You can dispense with the preliminary block test—by finding the R.P.M. of airplane motors, prior to the final tachometer rating, with a

Veeder SPEED COUNTER



Simply hold the Veeder against revolving gear teeth; apply slight pressure for momentary start; holding pressure when wheels stop. Counter starts or stops revolving mechanism instantly, giving accurate readings without use of stop-watch. Price, \$2.50.

Veeder Counters for recording the production of machines are standard for all industrial purposes. Write for booklet.

The Veeder Mfg. Co.

56 Sargeant St., Hartford, Conn.

SEAMLESS STEEL TUBING

Large Stock on
HandPrompt Mill
Deliveries

COLD DRAWN SHAFTING AND SCREW STEEL

Eastern Distributors: ROBERTSON STEEL & TUBE CORP.

JULIUS BLUM & COMPANY

510-512 West 24th Street, New York, N. Y.

Branches: Boston, Chicago, Philadelphia

If You Do!

If you find a tube that's as tough and strong as a Dural Tube—

If you discover one that fights wear, resists corrosion and positively will not leak at the valve seat—

If it has the antimony red, resilient rubber that feels like velvet and wears like a pig's nose—

Then it's a safe bet that it's another



Dural Tube

DURAL RUBBER CORPORATION

Flemington, N. J.

AVIATION

After the War

A most important and exhaustive document on the PEACE-TIME USES OF AIRCRAFT, PROPOSED LEGISLATION AND REGULATIONS has just been issued by the

BRITISH PARLIAMENTARY COMMITTEE

ON

CIVIL AERIAL TRANSPORT

This report covers a period of intensive study by the most eminent authorities in England during the past twenty months.

As only a very limited number of copies of the original report were printed and no more can be obtained in this country, the Manufacturers Aircraft Association, Inc., has reprinted the complete report (80 pages of text) in attractive pamphlet form, size 11 x 8 1/2.

Price Fifty Cents

Address:
MANUFACTURERS' AIRCRAFT ASSOCIATION, INC.
581 Fifth Avenue, New York

STIMPSON OVAL EYELETS



70 FRANKLIN AVENUE

BROOKLYN, NEW-YORK

ROME
AERONAUTICAL
RADIATORS

Developed from years of experience in building all types of radiators.

They possess every feature and qualification necessary for a high grade product.

STRONG
EFFICIENT
DURABLE

Used on the best American flying machines. Our engineering department is at your service.

Rome-Turney Radiator Company
Rome, N. Y., U. S. A.

Yates

Type C-20
Propeller
Boring
Machine

A recently perfected machine for automatically boring the necessary holes in the modern aeroplane propeller hub in one operation. Extremely durable, compact, and efficient. Does absolutely accurate and uniform work. Specially designed so that no oil can get on and impure the stock. Either belt or direct motor drive.

Send today for complete details

R. B. Yates Machine Co.
MILWAUKEE, WISCONSIN, U.S.A.

"The Crankshaft is the Backbone of the Engine. The Engine Cannot Be Better Than the Crankshaft."—N. W. A.

INTRODUCING THE "WHIPLESS"

AKIMOFF CRANKSHAFT

We are prepared to design such a shaft for your engine; it will give you smooth running and increased power.

VIBRATION SPECIALTY CO., Harrison Bldg., Philadelphia, Pa.

N. W. Akimoff, Engineer and Manager. His Initials Our Trade Mark.

Favoritely not connected with any other concern

QUALITY INSTRUMENTS FOR AIRPLANES

Indicating Dial Type Thermometers for circulating oil and water
Airspeed Indicators to determine buoyancy and avoid stalling
Oil Pressure Gauges
Air Pressure Gauges

The Foxboro line includes many other types of Indicating and Recording Instruments designed for all sorts of conditions and purposes.

Dallas No. 81-110 describes our complete Instrument line.

THE FOXBORO CO., Inc., FOXBORO, MASS., U. S. A.

New York Chicago Philadelphia Pittsburgh Newark Boston Minneapolis St. Louis Birmingham San Francisco





Tycoos
Aviation
Barometer
 Showing
 Altitude
 Height
 and
 Barometric Pressure

High Accuracy Component
 Movement

For your safety,
 accuracy and
 reliability, make
 your barometer
 a Tycoos

Thin Mark

Guarantee

Most workmanship given per accepted activity and performance as well. Since Oct. 1, 1919 the Paragon Thin-Mark has been official ship to active PAROCHOL design. Made at registered by Spanish Shells. Our managers are glad and delighted coming over 200,000 tons to foreign countries and so far we have made the most of the world.

PARAGON Propellers fly the world over

AMERICAN PROPELLER & MFG. CO.

Baltimore, Maryland, U. S. A.

D'Orey's Airship Manual

"A regularly timely and useful work, which does for the aerial navy of the world something like what Brassey's Annual does for the marine fleet."—*New York Tribune*, June 8, 1918

\$4.00

THE GARDNER-MOFFAT CO., INC.
22 East 17th Street New York

JACUZZI BROTHERS
1450 San Pablo Ave., Berkeley, Cal., U. S. A.



Producers of every description for Alpacas, Angoras, Duffels, Richmans, Hobbies, etc. Also, for men, for any type of watch, including Montecarlo Master, Ford Master, Cartier, Hall Scott, Hispano-Suiza, Liberty Twelve, etc.

Get our prices before ordering. Highest efficiency guaranteed

Titeflex

TITEX FLEXIBLE HOSE CORP.

Bends with the metal and is permanently tight. No
packing or sliding action to cause leakage.

GASOLINE, OIL, AIR, STEAM, AND VAPORS COMPLETELY
ARMORED GASOLINE AND OIL RESISTANT—See our
bulletin, complete and send today request.

FIRE-PROOF—Fits hot steam, superheaters, turbines and electric
and condenser coils.

TIRE INFLATION TUBES

MUFFLERS AND EXHAUST PIPES

TITEX-FLEX METAL HOSE CORPORATION

Bellevue Ave., E. Franklin Street, Newark, N. J.

All-Metal Flexible Tubing

Grand Rapids Vapor Kilns
are used by these several concerns with absolute satisfaction:

Standard Vapors Corporation
Fisher Paper Company
American Plywood & Mill Co.
Aluminum & Vapors Corp.
Kaiser Aluminum Corp.
Thompson-Ramsey Vapors Corp.

Submit your drying problem to experts, who make it especially at kilns. They are prepared to furnish and install all equipment and instruments.

GRAND RAPIDS VENEER WORKS
Grand Rapids, Michigan Seattle, Washington

FLYING SCHOOL
 Pioneer and advanced courses in field and 10000 ft. courses
 equipment. Instructors are experienced and a much less cost as
 they deliver after receiving pilot's license

Excellent Winter Weather
 Training has been reduced so that the principal course including
 instrument, night navigation, window flying, and low
 altitude and very difficult terrain. Winter course

Bill Fowler, Chief Instructor
 Write for free literature folder

DEWEY AIRPLANE COMPANY, INC.
 Doney, Ohio
 Manufacturers of sport, military and commercial airplanes

Offer, subject to prior sale, the following equipment:

Hypocyclone A	250 HP
Generator	100 HP, 3 ø
Compressor OX2	90 HP
Ball Mill No. 1	215 HP
Compressor V2	100 HP
Chopper	250 HP
Thermos	175 HP

and others from 30 HP up. Prices very reasonable.
Send for list "AN" from your needs.

U.S. AIR EXCHANGE 2500 Airway Road, Dept. 100, St. Louis, Mo. 63114

**FOR SALE
AIRPLANES**

Royal Flying Corps Canadian
Training Planes, equipped with
Caters 90 H. P. OX 5 engines.
First-class flying condition.
Immediate delivery. \$2,000.00 each.
Complete supply service

UNITED AIRCRAFT ENGINEERING CORPORATION
11 Vandewater Avenue, New York, N. Y.



EXPRESS IN THE MANUFACTURE OF PROPELLERS

STONE PROPELLER CO.
SUPREME
 DAYTON, OHIO, U.S.A.

Reliable 1 and 2 *Finest*
Express Shiping

We carry a large variety of propellers in stock. Our extensive
 facilities enable us to build propellers to order.

Future Flyers
ATTENTION!
You have the opportunity of learning to
FLY for PLEASURE or BUSINESS
SCHOOL NOW OPEN.
We are glad to receive inquiries
FRICKETTS FLYING CLUB, Princeton, N. J.
WEST VIRGINIA AIRCRAFT CO., Wheeling, W. Va.

Quality Springs
Specialists in Steel-
Treating Vanadiums
New York Wire & Spring Company
585 Washington Street, New York

Half of the American airmen have proved the Berling's worth.

Berling Magneto
WORTH MORE DORE MORE

**AIRCRAFT
INSTRUMENTS**

PIONEER INSTRUMENT COMPANY
380 CANAL STREET NEW YORK CITY

G&O
Radiators
For Airplanes
Lightweight — Strength — Quality
THE G & O MFG. CO., New Haven, Conn.

CAPITAL INTERNAL GRINDER STAMPINGS JIGS TOOLS DIES

We realize in our line of service there should be no faulty material. All machine parts must be made right and perform their function properly. Hence we have engaged our own plant to turn out work of the highest quality. We offer our facilities to you and insist we may be of service.

Will you give us a trial?

LANSING STAMPING & TOOL CO.
LANSING, MICHIGAN



P & L Preservative Cable Lacquer Defies Rust!

Representative Company: Cable America & Wire Corp.

BECAUSE such destruction is almost sure to prove fatal when it occurs on the cables used in aircraft construction, an "ounce of prevention" is being used in the shape of *P & L Preservative Cable Lacquer*.

It is making a name for itself in this service on account of its ability to withstand the constant vibration of the wires when the machine is in flight. This unusual elasticity combined with the fact that it is impervious to the abrupt atmospheric changes encountered in flight, make it an ideal product for this use.

PRATT & LAMBERT AIRPLANE FINISHES

Beside this rough, elastic metal coating, this line includes varnishes and enamels for brushing, spraying and dipping. The entire line is made by men who have helped make the name Pratt & Lambert the standard of quality in this country for 70 years.

If you have any problems in connection with the finishing of aircraft, do not hesitate to submit them to us for consideration. You can feel assured that you will receive the same careful thought and consideration that we give to every problem submitted to us by the government during the world war.

That we were successful in the solution of these problems is apparent from the thousands of barrels of aircraft finishes furnished by us for use on Army and Navy machines.

PRATT & LAMBERT-INC.

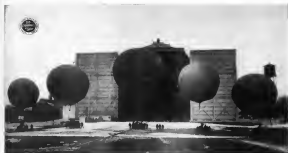
Producers of the *Manufacturers of Aircraft Finishes*
131 TONAWANDA ST., BUFFALO, N. Y.

NEW YORK BRIDGEBURGH, ONTARIO CHICAGO
FACTORIES

Check off the following in which you are interested and mail to us:

- ☐ Impregnation — a waterproof varnish for wood and fabric
- ☐ Hard Aircraft Enamel and other
- ☐ Wing Enamel, all colors
- ☐ Liquid Wood Filler
- ☐ Propeller Varnish
- ☐ Preservative Cable Lacquer

April 11, 1939



Merely the Fore-Runners

The eight hundred full-size balloons that The Goodyear Tire & Rubber Company has manufactured during the last nine years can only be regarded as the fore-runners of third dimension transport.

Just as the early spherical balloons have been succeeded by larger and more practical types, so will the dirigibles of today be merely modest precedents for tomorrow.

We are confident that the day is not far distant when passenger travel by air will be an established reality—established on a commercial basis as one of the necessary forms of modern transportation.

We are prepared for the great future.

For nine years The Goodyear Tire & Rubber Company has been the leading manufacturer of rubberized balloon fabric in America.

This supremacy has naturally led to pioneering the development of craft lighter than air.

It has produced a body of Goodyear workmen who are truly balloon craftsmen.

It has developed aeronautic engineers and designers of unquestioned competence and authority.

Balloons of every standard size and type—spherical, advertising, kite and dirigible—are constantly being produced in the Goodyear factory and tested over the Goodyear Aviation Field.

On special sites we are prepared to submit plans and specifications for any type of lighter-than-air craft—from miniature models to huge Trans-Atlantic Liners.

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO

GOOD YEAR
AKRON

United States Balloon Fabrics



AS the world's largest rubber manufacturer we are able to supply everything in the line of balloon fabrics: double and single ply, bias and parallel, tape for strapping, and other requisites. They are used and approved by the Bureau of Aircraft Production of the United States Government at Washington.

High quality has always been maintained during our years of experience in the manufacture of balloon fabrics. Strong and gas-tight, they withstand all weather and age well.

We also manufacture Airplane Tires, Shock Absorbers, Gasoline and Radiator Hose, Rubber Matting and Shoes for Aviators.

United States Rubber Company